BROKK BM 250 Deployment

Accelerated Site Technology Deployment
Integrated Decontamination and Decommissioning Project

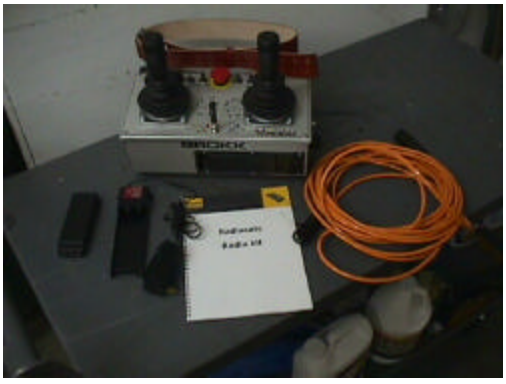
Need

Many U.S. Department of Energy facilities have fulfilled their useful lives and are in the process of being decontaminated and decommissioned. In order to ensure worker safety, remote systems that keep workers removed from demolition areas are needed.

Technology Description

The BROKK robot, developed by Holmhed Systems AB in Skelleftea, Sweden, is a remote-controlled concrete demolition system that replaces hand-held equipment like jackhammers. It consists of a revolving table, capable of continuous rotation, mounted on a tractor-like base. Extending from the table is a three-part hydraulic arm, to which a variety of end effectors can be attached. The Idaho National Engineering and Environmental Laboratory (INEEL) possesses a LaBounty Shear, BROKK Hammer, Rammer Shear/Crusher, BROKK Rotating Grapple, BROKK Loader Bucket, McDonnell Scabbler, and Pentek Squirrel II Scabbler. The Pentek Scabbler was designed for manual use, but has been adapted to fit the BROKK, because it contains a vacuum for dust control. Solid rubber wheels mobilize the robot, and hydraulic outriggers extend beyond the tires to add stability during operation.

The BROKK can be manipulated from as far away as 200 feet using a tether or 400 feet using a radio remote control. The control unit is strapped about the operator's waist. On its face are a variety of buttons and dials and two levers that control operation of the robot.



Radio Remote Control

Technical Data

Weight	6750 lb	Motor Output	22 kW
Min. Width	47.6 in.	Max. attachment wt.	660 lb
Min. Height	69.3 in.	Arm Length	15 ft

Benefits

- Operated by remote control, allowing the operator to be positioned at a safe distance from high radiation areas and falling debris
- Working time is less than half that of most manual tools, significantly reducing cost, schedule, and worker radiation exposure
- Powered by a 440 volt, 3 phase motor, eliminating problems of exhaust fumes in containment areas
- Useful for a wide range of tasks in various work conditions from breaking, removing, and loading concrete debris to removing radioactive waste from high radiation areas
- Durable—operated on double 10-hour shifts for weeks without failure (expected useful life is at about 10 years)

Status at the INEEL

The BROKK was deployed at the INEEL's former Security Training Facility (STF) in June and July of 1999. Piping covering an entire wall in the building was cut with a LaBounty MSD-7R Shear attachment. In addition, the BROKK Hammer made two holes through cast iron and concrete plates in the facility's basement that workers could not have made with a jackhammer or cutting torch. The INEEL expects a wide variety of other deployments on its upcoming Decontamination and Decommissioning (D&D) projects. In addition, Oak Ridge National Laboratory and the INEEL Robotics Cross-Cutting Group will use the BROKK to test a Universal Control console they are developing. Cost savings for the BROKK are being calculated on a per-job basis, because of the variety of its capabilities. At STF, the BROKK has saved thousands of dollars.

BROKK in use at STF

Status at ANL-E

Crews used two BROKK BM 250 robots during D&D of the Chicago Pile 5 (CP-5) reactor. The BROKKs operated with two types of attachments—a hydraulic hammer and a bucket. Operators used the hammer to break the high-density concrete bio-shield of the Research Reactor and the bucket to load debris into waste containers. The walls of the bio-shield, constructed of high-density concrete with metal stampings as the main aggregate component, were four to five feet thick and 15 feet high. Numerous pipes and passages ran through the concrete into the reactor. Radiation levels around the reactor reached 7 Rem per hour, and the material had readings up to 25 Rem on contact.

ANL-E workers used a remote control with a multi-wire tether to control each BROKK. The two machines worked in tandem on continuous shifts. A typical operator position was to the side and back of the machine, approximately 8 to 10 feet from the point of work. The BROKKs were successful in accelerating the schedule and reducing the cost of this D&D work.

BROKK removing support beams under the CP-5 reactor

BROKK with bucket attachment scooping up rubble from CP-5 Reactor bio-shield

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